# The Effect of Political Polarization on State Government Bonds

**Abstract**

We examine the effect of political polarization within state legislatures on state bond yields. Defined as the ideological distance between the Democratic and Republican members of the state legislative chambers, political polarization captures the willingness of legislators to seek bipartisan compromises. We expect that states with high polarization are riskier because they are more likely to experience gridlock, which negatively affects economic development and commitment to debt service. We find that the bonds issued by highly polarized states exhibit significantly higher yields at issuance compared to the states with lower levels of political polarization. A one standard deviation increase in polarization increases bond yields by 14.7 basis points and total interest expense by $4.3 million for an average bond issue. Furthermore, we find that the effect of polarization on bond yields is greater for general obligation bonds.

Keywords: Political Polarization, State Bonds

> "There is one unavoidable fact about legislating in a democratic system. No single person, faction, or interest can get everything it wants. Legislating inevitably means compromising, except in the rare circumstances when consensus is so strong that one dominant view can prevail with ease."
>
> Robert Kaiser 2013, p. 174

## 1. Introduction

The dispersion of power in a democratic political system makes it difficult for one political party to make effective policy without the cooperation and support of members of the other party. Despite the prediction that a two-party system generates convergence (Downs, 1957), many studies point out that political polarization has become a defining trend in American politics (Alesina and Rosenthal, 1995; Shor and McCarty, 2011).[1] A 2014 Pew Research report notes that "Republicans and Democrats are more divided along ideological lines – and partisan antipathy is deeper and more extensive – than at any point in the last two decades." This growing partisan polarization is troubling because it discourages productive compromise. Polarization is also concerning to market participants. Recent press indicates that even for relatively risk-free treasury bills, polarization has led to increases in bond yields.[2] Furthermore, a recent report by Moody's points out that political polarization makes budget and financial decisions more difficult and could lead to rating downgrades for U.S. states (Moody's, 2013).

We examine whether polarization at the state legislative level influences investors' risk evaluations as reflected in yields on state government bonds. Our primary tests exploit both cross-sectional and temporal variance in polarization using a large sample of new bond

[1] See Fiorina and Abrams (2008) for a comprehensive survey of this literature.

[2] As widely reported by financial press in July, 2017, concerns over a legislative impasse for the federal government's debt ceiling is estimated to have increased 3 month T-bill yields by over 10 basis points (see e.g., https://www.bloomberg.com/news/articles/2017-07-21/game-of-twister-awaits-t-bills-as-debt-ceiling-anxiety-deepens accessed on Nov 20, 2017).

issuances by state governments between 2000 and 2014.

We believe that political polarization within state legislatures is primarily linked to the cost of borrowing as default risk in two ways. First, a more polarized legislature is less likely to compromise across party lines and, therefore, experience gridlock (Binder 1999; McCarty 2007). Consequently, political polarization can obstruct a state legislature's ability to reach consensus on fiscal decisions. For instance, polarization in California's legislature in 2009 led to a delayed budget because Republicans and Democrats could not reach a consensus on balanced financial operations. Similarly, Illinois is experiencing an ongoing budget impasse which has lasted for several years. Not surprisingly, Illinois' lack of a budget has led to credit rating downgrades because it poses a threat to the timely payment of the state's core priority payments, including debt service (Fitch, 2017; Moody's, 2017; S&P, 2017). In the event of difficult or stressful economic cycles, a polarized legislature may have even greater difficulty in reaching the consensus necessary to either raise taxes or prioritize debt service[3]. Second, McCarty (2007) argues that "the most direct effect of polarization-induced gridlock is that public policy does not adjust to changing economic and demographic circumstances," which suggests that polarization may negatively affect a state's long-term economic development. Hence, even if the state's current fiscal condition is strong, polarization could increase investors' risk assessments for bonds.

We measure political polarization using data from the American Legislatures project (Shor and McCarty, 2011). Defined as the average ideological distance between the median of

[3] Recent commentary from Fitch ratings indicate that even for triple A rated Minnesota, political dysfunction poses a threat to debt service payments (Fitch, 2017).

the Democratic and Republican parties in the state legislative chambers, Shor and McCarty (2011) measure polarization using both the Project Vote Smart National Political Awareness Test (NPAT) and legislative roll call data from all 50 states. These data allow us to consistently compare political polarization across chambers (house or senate) within a state, between states, and across years.

Consistent with expectations, we find a significant positive association between initial bond yields and political polarization, illustrating that the cost of borrowing is higher for states with more politically polarized legislatures. Our regression estimates indicate that a one standard deviation increase in political polarization is associated with a 14.7 basis point increase in overall bond yields at issuance, after controlling for risk factors previously identified in the literature. The magnitude of this effect is roughly equivalent to the benefit of credit enhancement (through bond insurance) in decreasing yields. For a bond issue of average size ($280.51 million) and time to maturity (10.34 years) in our sample, a one standard deviation increase in polarization increases total interest expense by $4.3 million (i.e., $280.51 x 0.00147 x 10.34).

Consistent with debt service of general obligation bonds being more directly influenced by a state's legislative environment, we predict and find that the effect of political polarization on yields is concentrated in general obligation bonds rather than revenue bonds for which debt service is tied to revenues from specific projects (e.g., a toll road). For general obligation bonds, we find that a one standard deviation increase in political polarization is associated with a 21.44 basis point increase in yield at issuance.

To better tie our findings to investors' perception of risk, we examine whether our

results vary with the downgrade of bond insurers. The municipal bond market is unique in that a significant portion of bonds are sold with insurance provided by one of the major "monoline" insurers such as AMBAC and MBIA. Bond insurance guarantees principal and interest payments in the event of default and negates the need for investors to monitor the creditworthiness of state and local governments. However, during the financial crisis, the major bond insurers lost their triple-A ratings due to their exposure to subprime mortgages.[4] The demand for insurance fell considerably after their initial downgrades in 2008.[5] Without high-quality insurance, bond investors have less protection from the potentially adverse consequences of fiscal dysfunction in state government. Using this setting, we test whether the effect of political polarization on initial bond yields is greater for bonds issued during the one-year period immediately following the June 18, 2008 downgrade of the major bond insurers than during the one-year period immediately preceding this event. Consistent with polarization increasing risk, our results indicate that the effect of polarization on bond yields is stronger in the post-downgrade period compared with the pre-downgrade period.

One concern related to our analysis is that our results are drive by an unspecified omitted variable. For this to be a concern, this omitted variable needs to be correlated with our measure of polarization and explain bond yields. In our survey of the determinants of political polarization, we believe that most explanations for polarization (e.g., gerrymandering) are unlikely to affect bond risk. However, economic factors (e.g., rising income inequality) may explain both polarization and also be correlated with bond yields. In robustness tests we find

[4] See Duffie (2017) for a summary of regulatory reforms after the financial crisis.

[5] From a high of 57% insured before the financial crisis to 19% in 2008, and to 3.5% in 2012. (http://www.bondbuyer.com/issues/123_83/bond-insurance-then-and-now-revival-of-industry-1062071-1.html. Accessed on Nov 21, 2017)

that our estimates of the effect on polarization on bond yields are unaffected by including controls for such economic factors.

Our study contributes to a vast literature which examines the real effect of the political economy on financial markets[6]. However, research on the political determinants of risk in a municipal setting is relatively scant. Gao and Qi (2015) examine how uncertainty over gubernatorial elections affects municipal bonds yields[7]. They argue that uncertainty over which candidate's economic policies will be implemented can create risk. Our study focuses not on the ambiguity over whose policies will be implemented but on the risk stemming from polarization or the lack of compromise. This study is the first we are aware of that examines the effect of political polarization on the cost of state government borrowing. Using a comprehensive sample of state-level debt, we find that polarization increases the cost of borrowing for state governments. Given the increasing trend in polarization, these findings have important implications for policy makers and the general public.

This study also contributes to the growing literature on the determinants of borrowing costs for state and local governments, such as competition amongst underwriters (Kessel, 1971), insurance (Kidwell, Sorensen, and Wachowicz, 1987), disclosure regulation (Benson et al. 1991; Baber and Gore, 2008; Bloch et al., 2016), tax policy (Ayers et al., 2005), natural disasters (Marlowe, 2006), credit default swaps (Marlowe, 2011), liquidity risk (Marlowe, 2015), distance to investment banks (Butler, 2008),[8] transparency (Schultz, 2012), accounting

[6] The literature is too large to summarize, however authors examine how elections impact economic policy choices (Besley and Case, 1995); how a lack of political competition leads to policies that hinder economic growth (Besley, Persson, and Sturm, 2010).

[7] Another stream of research studies political corruption and municipal borrowing costs (Butler, Fauver, and Martal, 2009); how fiscal institutions affect municipal bond secondary market quoted yields (Poterba and Rueben, 1999); and how fiscal imbalance influences the borrowing cost of municipal bonds (Novy-Marx and Rauh, 2012).

[8] Similarly, Jaggi and Tang (2015) also find that distance influences corporate credit ratings and debt costs.

restatements (Baber et al., 2013), liquidity (Wang et al., 2008; Schwert, 2017), internal control deficiencies (Park et al., 2016), social capital (Li et al., 2017), tax privilege (Babina et al., 2017) and state policies for distressed municipalities (Gao et al., 2017).

The rest of the paper is organized as follows. Section 2 contains background and hypothesis development. Section 3 describes the data and methodology. Results are shown in Section 4 and Section 5 concludes.

## 2. Background and Hypothesis Development

### *2.1. State Bond Market*

State governments issue bonds to finance public purpose projects like roads, schools, airports and stadiums. These bonds are generally classified into two major categories, general obligation bonds and revenue bonds. State-level general obligation bonds are secured by tax revenues which include income tax, sales tax and various excise taxes, and are typically backed by the full faith and credit of the issuing state. Additionally, states usually have statutory mechanisms which include an irrevocable and continuing appropriation for all general obligation debt service. These mechanisms give the state treasurer or comptroller continuing authority and direction to make all necessary debt service payments on general obligation bonds from any and all revenues and funds of the state.

General obligation bonds contain either unlimited or limited pledges, where limited pledges place a cap on the ability of the issuer to levy taxes. General obligation bonds with an unlimited pledge theoretically allow the issuer to raise taxes to the extent necessary to support

debt service. The majority of state level general obligation bonds contain unlimited pledges.[9] In contrast, revenue bonds are issued to finance a particular project, such as a toll roads, and debt service obligations are secured exclusively by revenues of that specific project. Given the tax pledge, the general obligation bonds are typically viewed as more secure than revenue bonds.

State and local government bonds are typically issued through either a negotiated offering or a competitive sale. In a competitive sale, bond offerings are awarded to underwriters based on the overall interest cost (Nauss, 1986). In a negotiated sale, an underwriting syndicate is selected to sell bonds to investors. Most studies suggest that the competitive bidding process results in lower interest costs (Benson, 1979; Simonsen and Robbins, 1996).

### *2.2. Determinants of Polarization*

The political science literature has indicated a variety of factors as possible causes for increasing political polarization, including a polarized electorate, gerrymandering, party realignment, income inequality, economic well-being, donor effects, and the media. We describe in more detail each cause and separate them broadly as non-economic and economic factors.

#### *2.2.1. Non-Economic Factors*

Layman and Carsey (2002) and Levendusky (2009) find that polarization may be an overall reflection of voters holding views more strongly aligned with their parties' policy positions. Recent studies argue that the proliferation of more partisan media has made elections more partisan (Prior 2007), causing officials to become more aligned with partisan views for fear of being portrayed negatively to their political base. Special interests may also influence

[9] Due to a constitutional cap on property tax, Nevada is one of few states that issue limited general obligation bonds.

politicians to take more partisan positions (Lessig 2011). Barber and McCarty (2015) highlight that a Southern realignment may explain increasing polarization. Since the 1970's, we have seen more Republicans representing Southern districts. As Republicans replace more moderate Democrats, the average Southern Democrat that is still left is likely to be more liberal.

Tufte (1973), Carson et al. (2007) and Theriault (2008) indicate that gerrymandering, or drawing congressional districts that lead to overwhelmingly partisan and safe districts, which frees candidates from the need to compete for more moderate votes, contributes to polarization. However, McCarty et al. (2006) and McCarty et al. (2009) find that polarization is not explained by gerrymandering. Specifically, these authors find that polarization exists even with random district borders.

*2.2.2. Economic Factors*

The political science literature also indicates that economic factors may contribute to polarization. McCarty et al. (2006) and Voorheis, McCarty, and Shor (2017) show a close correlation between economic or income inequality and polarization. However, Edsall (2012) explains that inequality is driven by economic crisis and the ensuing competition over diminishing resources. Therefore, polarization stems from a deterioration in economic well-being.

## 2.3. Hypothesis Development

*2.3.1. Political Polarization and Investors' Perceptions of Risk*

Investors consider various factors in evaluating the credit quality of a state bond, including the issuer's sources of income, the strength of its balance sheet, its vulnerability to

changing economic conditions, and the quality of its budgeting and oversight processes. Credit ratings are useful summary measures of state's creditworthiness, but ratings are constrained to categories and tend to be untimely (Hull et al., 2004). This paper examines the political dynamic of polarization in state legislatures and how it affects investor's perception of creditworthiness. Political polarization discourages compromise, which adversely affects a legislature's ability to make timely fiscal and budgetary decisions. The risk of budget delays create uncertainty and may call into question the ability and willingness to pay debt service. The inability to come to timely fiscal decisions may adversely affect the perceived commitment to service debt. In times of economic distress, a highly polarized legislature may be less likely to prioritize debt service or raise taxes in order to fund debt service. We expect investors' perceptions of state default risk are increasing in the level of political polarization within the state's legislature, resulting in a positive relation between polarization and bond yields.

> **H1**: Ceteris paribus, political polarization within state legislatures increases investors' perceptions of default risk and, therefore, increases the yield on newly issued state bonds.

*2.3.2. Bond Types*

The majority of state bonds fall under two categories, general obligation bonds and revenue bonds. State level general obligation bonds are secured by a state's tax revenues, which are dependent on legislative action. We expect that polarization will have a stronger effect on general obligation bonds because legislative impasses have direct influence over tax revenues and how they are budgeted and spent.

On the other hand, revenue bonds are issued to finance particular projects such as

stadiums and toll roads. The principal and interest of these bonds are secured exclusively by project revenue streams. Revenue bonds may be influenced by the overall economic health of a state. However, because the security of revenue bonds is not directly tied to legislative action, we expect political polarization to have a less direct effect on these bonds. Therefore, we expect the effect of political polarization on state bond yields will be greater for general obligation bonds than for revenue bonds.

**H2**: Ceteris paribus, the effect of political polarization on bond yields will be stronger for general obligation bonds compared to revenue bonds.

## 3. Data

### 3.1. Sample Selection and Calculation of Variables

Our sample includes 45,177 general obligation and revenue bonds issued by states between 2000 and 2014 as reported in the Mergent Municipal Bond Securities Database (Mergent). Mergent provides issue-specific information such as bond yield, bond size, issue size, bond offering year, bond insurance, credit rating, bond type, maturity date, optional call schedule, puttable, and bank qualified indicators. To control for state-level demographics that may affect bond yields, we use state-level data on income per capita and population from the United States Census. We merge these macroeconomic variables with a lag of one year from the bond issuance date. To control for overall interest rates, we include the U.S. Treasury bond yields matched to state bonds by duration and the month of the settlement date. The main variables used in this study are defined in Appendix A.

Following Butler et al. (2009), we use the most recent Standard and Poor's ratings of a state's general creditworthiness as a proxy for a bond's default risk. To facilitate regression

analyses, we transform bond ratings into a numeric scale ranging from 1 for AAA ratings to 10 for BBB- ratings. See Appendix B for the complete classification scheme.

While our primary dependent variable is bond yield at issuance as reported by Mergent, we also perform tests using state bond yields constructed from secondary market trading data for the period of June 2007 and June 2009 from the Municipal Securities Rulemaking Board (MSRB) Database. MSRB provides the trade price, CUSIP number, security description, coupon, trade date, maturity date, an indicator showing whether the trade was initiated as a purchase from a customer, a sale from a customer, or an interdealer transaction. Following Bessembinder et al. (2009), we calculate a volume-weighted trade price for each bond on each date when the bond is traded. The analysis is restricted to the trades that are customer initiated buy orders (Downing and Zhang, 2004). We convert the price to a yield and match this to the Mergent dataset by CUSIP.

### 3.2. Measure of Political Polarization

Our measures of political polarization are derived from data made available by Boris Shor's and Nolan McCarty's American Legislatures Project.[10] Using both survey data from Project Vote Smart's National Political Awareness Test (NPAT)[11] and legislative roll-call voting data from all 50 states, Shor and McCarty (2011) employ a two-step process to construct ideal points for state legislators that are comparable across legislators, states and time. NPAT is a recurring national survey that asks political candidates questions related to foreign policy, national security, international affairs, social issues, fiscal policy, environmentalism, criminal justices, and so on. Because NPAT participation is voluntary, it is not completed by all

[10] These data are available at https://americanlegislatures.com/. More specifically, we use dataset 4.0 released in June 2015.

[11] See website of Project Vote Smart at http://www.votesmart.org.

candidates. Therefore, Shor and McCarty (2011, 534) first estimate "roll-call based ideal points for all legislators in each state" and then "project them into the space of NPAT ideal points using ordinary least squares (OLS)." They then generate predicted NPAT scores for non-respondents using state-specific regression parameters. The end result is a political ideology score for each legislator measured on a scale that is comparable across legislators, states and time. For each state-year combination, political polarization within each of the house and senate chambers is measured as the difference between the median ideology score of chamber Democrats versus that of chamber Republicans. Shor and McCarty label these polarization measures h_diffs and s_diffs, respectively, for the house and senate chambers.

Because the legislative process requires approval from both the house and senate chambers, high polarization in either chamber increases risk of an impasse. Therefore, we define polarization as the greater of h_diffs or s_diffs for each state-year observation.[12] Table 1 presents summary statistics for the polarization measure. For most states, polarization shows an increasing trend across time. Shor and Marty (2011) indicate that missing observations for polarization occur when a state does not make roll call vote data available.

<Table 1>

State legislative sessions typically last for 2 to 9 months, usually beginning early in the year. We align state-year polarization measures, which reflect votes during these legislative sessions, with bond issuances occurring after the end of that session and before the end of the next session. For example, California's 2012 legislative session ran from January 4 to August

[12] Alternatively, defining polarization as the average of h_diffs and s_diffs for each state-year observation produces results entirely consistent with our reported results.

31. California bonds issued after August 31, 2012, and before the end of California's 2013 legislative session are matched with polarization measures for California's 2012 legislative session. Bonds issued by states during years with missing polarization data are excluded from our sample.

3.3. Summary Statistics

Table 2 provides summary statistics for regression variables. The sample consists of 45,177 general obligation and revenue bonds issued between 2000 and 2014. The average yield to maturity at issuance is 3.50 percent. The average size of an entire issue and the average size of an individual bond issue are 280.51 million and 13.24 million, respectively (untabulated). The average of the natural logarithm of an individual bond issue is 15.21, and the average maturity is 10.34 years. The average bond rating is 2.76, which is roughly equivalent to an S&P rating of AA. General obligation bonds represent 71 percent of the sample. A Pearson correlation matrix is provided in Table 3. The significance level of correlation coefficients at the 5% level or better are starred. We note that the bivariate correlation between polarization and bond yields is negative. This is a broad reflection of the fact that bond yields have been decreasing over our sample period (due to overall decreases in interest rates and municipal default risk) while polarization exhibits an increasing trend. We examine economic and statistical significance in our multivariate regressions.

<Table 2>

<Table 3>

## 4. Results

### 4.1. Bond Yields and Polarization

We use the bond yield as our primary test of the effect of political polarization on a state's default risk. Given that the typical municipal investor is a buy-and-hold retail investor, default risk accounts for the majority of the risk component in bond yields (Schwert, 2017).

We use the bond-level control variables that have been used by Hastie (1972), Blackwell and Kidwell (1988), Kao and Wu (1994), and Nanda and Singh (2004). These include controls for bond size, maturity, rating, the method of sale, the type of bond, callable bonds, puttable, and bank qualified bonds. We include bond size as a proxy for liquidity, as in Bergstresser et al (2013). Longstaff (2011) emphasizes that liquidity impacts municipal bonds prices. The bond size is measured by taking the natural log of the principal amount of each individual bond. Maturity is calculated as the number of days between the maturity date and the offering date divided by 365. Credit rating is an assessment for the default risk of municipal bonds given by rating agencies, such as Moody's, Standard & Poor's, and Fitch. Bond ratings are the alphanumeric conversions of ratings issued by the rating agencies. The offering type indicates the method of sale and takes a value of one if the issue sale is competitive and zero if the sale is negotiated. Insurers provide a guaranty of principal and interest payments for municipal bonds in the event of default. The credit ratings of bonds with insurance reflect the insurers' creditworthiness instead of the state's underlying creditworthiness. We include an indicator variable, insurance, which takes a value of one if the bond is insured and zero if the bond is not insured. We include income per capita, which is adjusted by the Consumer Price Index (CPI), and population from decennial censuses as the state-level demographic controls. The natural

log is applied to both the income per capita and population. Information on Treasury bonds is collected from the Center for Research in Security Prices (CRSP). They are the monthly CRSP fixed-term indices for the periods 1, 2, 5, 7, 10, 20 and 30 years. We use linear interpolation of the yields of the two Treasury bonds that have the next lower and higher duration relative to the respective state bond. We delete observations with a duration of less than one year. For bonds with a duration of more than 30 years, we use the 30-year Treasury yield. We also include both state and year fixed effects. The standard errors of the regression are clustered at the state level.

To examine how political polarization within state legislatures affects the yields of state-issued bonds, we estimate the regression shown in equation 1 using ordinary least squares (OLS) regression analysis. The dependent variable is a state bond's yield to maturity at the time of issuance. The variable of interest in this specification is polarization.

$$\begin{aligned} Bond\ \ Yield = {} & \beta_0 + \beta_1 Polarization + \beta_2 Bond\ \ Size + \beta_3 Maturity + \beta_4 Rating \\ & + \beta_5 Insurance + \beta_6 General\ \ Obligation\ \ Bond + \beta_7 Competitive\ \ Bid \\ & + \beta_8 Callable + \beta_9 Puttable + \beta_{10} Bank\ \ Qualified + \beta_{11} Treasury\ \ Yield \\ & + \beta_{12} Population + \beta_{13} Income + \beta_{14} Tax\ \ Rate + Year\ \ Indicators \\ & + State\ \ Indicators + \ \ \varepsilon \end{aligned} \tag{1}$$

Table 4 reports the results of estimating equation 1. The coefficient on polarization is significantly positive, which is consistent with H1 that legislative polarization increases state bond risk and, consequently, bond yields. The results shows that a one standard deviation increase in polarization (0.54) is associated with a 14.7 basis point (0.273*0.54) increase in overall bond yields. The magnitude of the effect of a one standard deviation increase in polarization on yields is roughly equivalent to the estimated effect of bond insurance on yields

(e.g., -11.0 basis points). The entire offering size and time to maturity in our sample, on average, are $280.51 million and 10.34 years, respectively. This implies that a one standard deviation increase in polarization increases total interest expense per issue by $4.3 million (i.e., $280.51 x 0.00147 x 10.34).

<Table 4>

The control variable coefficients are generally consistent with expectations. Bonds with longer maturities have higher yields. Bonds with higher credit ratings have lower yields because they have lower predicted rates of default. Yields for general obligation bonds are lower because they are backed by the full faith and credit of the issuing state. Bonds with insurance also have lower yields because they are backed by the credit worthiness of bond insurers. Bonds with a callable provision have higher yields because the option for an issuer to call a bond increases interest rate risk for investors.

As a robustness test, we also examine the association between polarization and yield spreads. We examine the yield spread as an alternative way to capture the risk component in the pricing of municipal bonds. Schwert (2017) estimates that default risk accounts for as much as 84 percent of the municipal bond spread after adjusting for tax-exempt status. Tax-exempt bonds represent 90 percent of our sample. We replace bond yield with yield spread in equation 1 and calculate the spread using Treasury bonds as a risk-free benchmark. We calculate the yield spread by subtracting its corresponding Treasury yield from the state bond's yield matched by duration.

Table 5 reports the results of this test, which are consistent with our main analysis. A one standard deviation increase in polarization (0.54) is associated with a 17.0 basis point

(0.315*0.54) increase in overall yield spreads. The results indicate that the yield spreads are larger for bonds issued by states with high polarization.

<Table 5>

4.2. State Bond Yields and Polarization in the Pre and Post Insurer Downgrade Periods

To help validate our argument that political polarization increases bond risk, we compare the impact of polarization on bond yields in the secondary market before and after the downgrade of the major insurers of state and local bonds, AMBAC and MBIA. In order to overcome the confounding effect of issuing new debt, we compare the yields of existing bond issues in the secondary market. This analysis has the advantage of identifying how political polarization influences risk perceptions for a constant sample of bonds. The loss of triple A ratings for insurers began in June 2008 when Moody's downgraded AMBAC's credit rating three notches to Aa3 from Aaa. Moody's also downgraded the triple A rating of MBIA in June 2008. Before the downgrade of the insurers' ratings, we observe that bonds issued with insurance represent 25.7 and 34.4 percent of our sample one and two years prior to June 2008, respectively. After the downgrade of the major insurers' ratings, we observe that bonds issued with insurance represent 9.7 and 9.0 percent of our sample one and two years after June 2008, respectively. These observations are consistent with the trend reported by the Bond Buyer.[13] We expect the influence of polarization on bond yields to be stronger after the deterioration of the bond insurers' credit worthiness in June 2008.

We argue that the deterioration in the ratings of the bond insurers motivated investors

[13] The percentage of insured bonds decreases from 57 percent before the financial crisis to 19 percent in 2008, and to 3.5 percent in 2012. https://www.bondbuyer.com/news/bond-insurance-then-now-the-revival-of-an-industry, accessed on Nov 21, 2017.

to price more completely the risks inherent in the state governments primarily responsible for debt service. We argue that political polarization contributes to such risks.[14] Using this setting, we test whether the effect of political polarization on bond yields in the secondary market is stronger after the downgrade than before the downgrade. We refer to the period from June 19th, 2007 to June 18th, 2008 as the pre-downgrade period, and the period from June 19th, 2008 to June 19th, 2009 as the post-downgrade period. A dummy variable, *Post Period*, takes a value one if state bonds are traded in the post-downgrade period, and zero if bonds are traded in the pre-downgrade period. We generate interaction variables between *Post Period* and polarization and between *Post Period* and all control variables.

We utilize the OLS regression and use the bond yield as the dependent variable. The model specification is shown in equation 2. Because control variables may impact yields differently during pre- and post-downgrade periods, we estimate a full-interaction model. We predict that the coefficient on the variable of political polarization and the interaction variable between political polarization and *Post Period* will be positive and statistically significant. This test is conducted on a matched sample of bonds that were traded during the pre-downgrade as well as the post-downgrade periods.

[14] Gore et al. (2004) find that financial disclosures and bond insurance may be substitutes. Cuny (2016) also indicates that the deterioration in credit quality of the major bond insurers increased demand for voluntary disclosures.

$$
\begin{aligned}
Bond\ \ Yield = {} & \beta_0 + \beta_1 Polarization * Post\ \ Period + \beta_2 Polarization + \beta_3 Post\ \ Period \\
& + \beta_4 Bond\ \ Size + \beta_5 Maturity + \beta_6 Rating + \beta_7 Insurance \\
& + \beta_8 General\ \ Obligation\ \ Bond + \beta_9 Callable \\
& + \beta_{10} Puttable + \beta_{11} Treasury\ \ Yield + \beta_{12} Population + \beta_{13} Income \\
& + \beta_{14} Tax\ \ Rate + \beta_{15} Bond\ \ Size * Post\ \ Period\ \ + \beta_{16} Maturity \\
& * Post\ \ Period\ \ + \beta_{17} Rating * Post\ \ Period\ \ + \beta_{18} Insurance \\
& * Post\ \ Period\ \ + \beta_{19} General\ \ Obligation\ \ Bond * Post\ \ Period \\
& + \beta_{20} Callable * Post\ \ Period\ \ + \beta_{21} Puttable * Post\ \ Period \\
& + \beta_{22} Treasury\ \ Yield * Post\ \ Period\ \ + \beta_{23} Population * Post\ \ Period \\
& + \beta_{24} Income * Post\ \ Period + \beta_{25} Tax\ \ Rate * Post\ \ Period \\
& + Year\ \ Indicators + State\ \ Indicators + \ \varepsilon
\end{aligned}
\tag{2}
$$

Consistent with previous studies (Harris and Piwowar, 2006; Schultz, 2012), we control for bond size, maturity, credit quality, credit enhancement, general obligation bonds, bonds with callable options, bond with puttable options, and treasury yields. Additionally, we control for state-level demographic variables: income per capita and population. Standard errors are clustered at the state level.

The final sample consists of 276,766 total trades. There are 129,163 trades in the pre-downgrade and 147,603 trades in the post-downgrade period. The average bond yield is 3.953% during the pre-downgrade period, and 3.902% during the post-downgrade period.

The results contained in Table 6 show that there is a positive and statistically significant association between the yields and maximum political polarization values (coefficient=0.902, $p<0.01$) in the pre-downgrade period. Additionally, the results show that the coefficient of interaction variable between maximum polarization and *Post Period* is positive and significant (coefficient=0.133, $p<0.01$), which indicates that a one standard deviation increase in polarization (0.54) in the post-downgrade period is associated with a 7.2 basis point (0.133 *0.54) increase in yields compared to pre-downgrade period. We find that the association between the yields of municipal bonds and political polarization is higher in the post-

downgrade period. This result provides additional support that polarization is an important determinant of risk in the municipal bond market.

<Table 6>

4.3. Impact of Political Polarization on Different Bond Types

H2 predicts that the positive effect of polarization on bond yields will be greater for general obligation bonds than for revenue bonds. General obligation bonds and revenue bonds represent 70.6 percent and 29.3 percent of the sample, respectively. To test H2, we estimate regression equation 1 separately for state bonds of each type. Table 7 reports regression estimates for each sub-sample and for each measure of polarization.

<Table 7>

The results reported in Table 7 indicate that the effect of polarization on state bonds is concentrated in general obligation bonds. Using either measure of polarization, we find that the association between political polarization and bond yields for the general obligation bonds is positive and statistically significant. A one standard deviation increases in polarization (0.54) is associated with a 21.44 basis point (0.397*0.54) increase in yields for general obligation bonds, the repayment of which may depend on future fiscal decisions made by state legislatures. On the other hand, we do not find consistent evidence that political polarization influences the cost of borrowing for revenue bonds[15], the repayment of which depends on future project revenues that are largely independent of future legislative action. This pattern of effects is consistent with H2.

[15] Revenue bonds may be influenced by the overall economic health of a state. We find that the association between maximum polarization and bond yields has a p-value of 0.146.

## 4.5. Additional Analysis

### 4.5.1. Economic Conditions

The political science literature suggests that political polarization might be driven by diminishing economic opportunity (McCarty et al. 2006 and Voorheis, McCarty, and Shor 2017). Although our focus is on the effects of polarization rather than its causes, it is important that we rule out the possibility that the positive effect of polarization on bond yields might be driven by omitted economic factors that are positively correlated with both polarization and bond risk. In our survey of the determinants of political polarization detailed earlier, we believe that most explanations for polarization are largely exogenous of bond risk. However, Edsall (2012) indicates that economic weakness and its ensuing competition over diminishing resources could explain polarization. Economic deterioration could also explain risk associated with state government bonds. To examine if polarization is merely capturing this effect, we test to see if state gross domestic product (GDP) explains polarization. Four alternative measures of state economic conditions have been used: state GDP, percentage change in state GDP, GDP per capita, and percentage change in GDP per capita. The GDP data are from the United States Census. The natural logarithm is applied to State GDP and GDP per capita before being included in our models.

Panel A of Table 8 shows that the coefficient for political polarization is positive and significant, which is consistent with H1 that legislative polarization increases state bond yields. Our results are robust after controlling for various indicators for state economic conditions.

<Table 8>

#### 4.5.2. Income Inequality

As discussed in section 2.2.2, the political science literature suggests that political polarization might be driven by income inequality (McCarty et al. 2006 and Voorheis, McCarty, and Shor 2017). To rule out the possibility that income inequality is driving the impact of political polarization on bond yields, we re-estimate equation 1 including additional controls for income inequality. We use three alternative measures of income inequality at the state level: Gini coefficient, Atkinson Index, Theil's entropy index. These measures of income inequality are from data made available by Frank (2014).

Panel B of Table 8 reports the results after controlling for Gini index, Atkinson Index, Theil's index, respectively. We find that our results are robust to these alternative specifications. The coefficient for political polarization remains significant.

#### 4.5.3. Change in Income

As discussed in section 2.2.2, the political science literature suggests that political polarization might be driven by changes in economic conditions (McCarty et al. 2006 and Voorheis, McCarty, and Shor 2017). To rule out the possibility of income changes driving the impact of political polarization on bond yields, we re-estimate equation 1 with controls for the change in income per capita. The measures of income at the state level are from the United State Census. We examine both change and percentage change in state income per capita, which is adjusted by the Consumer Price Index (CPI). The natural log is applied to the change

in state income per capita.[16]

Panel C Table 8 reports the results and shows that the coefficient for polarization is positive and significant, which is consistent with our main analysis that legislative polarization increases state bond risk and, consequently, bond yields.

## 5. Conclusion

Using Shor and McCarty's (2011) measure of polarization, this study examines how political polarization affects yields on state government bonds. Polarization measures the willingness of political parties to compromise and the ability of states to reach consensus on fiscal decisions. We find that bond yields are higher for states with higher levels of polarization at the legislative level and that this effect is concentrated in general obligation bonds, as opposed to revenue bonds, because the security of general obligation bonds is more directly tied to future legislative action.

We also find that the positive association between bond yields and polarization is stronger after the major insurers of state and local government bonds experienced credit rating downgrades in June 2008. This shock suggests that the lack of high quality bond insurance increased investors' exposure to risks inherent in politically polarized state legislatures.

[16] The transformation takes the logarithm of the absolute value of the variable plus 1. If the original value was negative, "put back" the sign of the data by multiplying by –1.

## References


Alesina, A., Rosenthal, H. (1995). Partisan Politics, Divided Government and the Economy. Cambridge University Press.

Ayers, B. C., Cloyd, C. B., & Robinson, J. R. (2005). "Read my lips…": Does the tax rhetoric of presidential candidates affect security prices? *The Journal of Law and Economics*, *48*(1), 125-148.

Baber, W. R., & Gore, A. K. (2008). Consequences of GAAP disclosure regulation: Evidence from municipal debt issues. *The Accounting Review,* 83(3), 565-592.

Baber, W. R., Gore, A. K., Rich, K. T., & Zhang, J. X. (2013). Accounting restatements, governance and municipal debt financing. *Journal of Accounting and Economics,* 56(2), 212-227.

Babina, T., Jotikasthira, C., Lundblad, C., & Ramadorai, T. (2017). Heterogeneous Taxes and Limited Risk Sharing: Evidence from Municipal Bonds. Unpublished working paper, Columbia University, Southern Methodist University, University of North Carolina, and Imperial College and CEPR.

Barber, M., & McCarty, N. (2015). Causes and consequences of polarization. *Political Negotiation: A Handbook*, 37.

Benson, E. D. (1979). The search for information by underwriters and its impact on municipal interest cost. *The Journal of Finance,* 34(4), 871-885.

Benson, E. D., Marks, B. R., & Raman, K. K. (1991). The effect of voluntary GAAP compliance and financial disclosure on governmental borrowing costs. *Journal of Accounting, Auditing & Finance,* 6(3), 303-319.

Bergstresser, D., Cohen, R., & Shenai, S. (2013). Demographic fractionalization and the municipal bond market. *Municipal Finance Journal,* 34(3), 1-38.

Besley, T., Persson, T., and Sturm, D. M. (2010). Political competition, policy and growth: theory and evidence from the U.S., *Review of Economic Studies,*77, 1329-1352.

Besley, T., and Case, A. (1995). Does electoral accountability affect economic policy choices? Evidence from gubernatorial term limits, *Quarterly Journal of Economics*, 110, 769-798.

Bessembinder, H., Kahle, K. M., Maxwell, W. F., & Xu, D. (2009). Measuring abnormal bond performance. *Review of Financial Studies,* 22(10), 4219-4258.

Binder, S. A. (1999). The dynamics of legislative gridlock, 1947-96. *American Political Science Review*, *93*(3), 519-533.

Blackwell, D. W., & Kidwell, D. S. (1988). An investigation of cost differences between public sales and private placements of debt. *Journal of Financial Economics,* 22(2), 253-278.

Bloch, R. I., Marlowe, J., & Mead, D. M. (2016). Infrastructure Asset Reporting and Pricing Uncertainty in the Municipal Bond Market. Journal of Governmental & Nonprofit

Accounting, 5(1), 53-70.

Butler, A. W. (2008). Distance still matters: Evidence from municipal bond underwriting. *The Review of Financial Studies*, *21*(2), 763-784.

Butler, A. W., Fauver, L., & Mortal, S. (2009). Corruption, political connections, and municipal finance. *Review of Financial Studies*, 22(7), 2673-2705.

Carson, J. L., Crespin, M. H., Finocchiaro, C. J., & Rohde, D. W. (2007). Redistricting and party polarization in the US House of Representatives. *American Politics Research*, *35*(6), 878-904.

Cuny, Christine. (2016). Voluntary disclosure incentives: Evidence from the municipal bond market. *Journal of Accounting and Economics,* 62(1), 87-102.

Downing, C., & Zhang, F. (2004). Trading activity and price volatility in the municipal bond market. *The Journal of Finance,* 59(2), 899-931.

Duffie, D. (2017). Financial regulatory reform after the crisis: An assessment. *Management Science, forthcoming.*

Edsall, T. B. (2012). *The age of austerity: How scarcity will remake American politics*. New York: Anchor Books.

Fitch (2017). Fitch Downgrades Illinois Ratings to 'BBB'; Negative Rating Watch Maintained.

Fitch (2017). Minnesota's Unresolved Political Dispute Clouds Next Legislative Session.

Frank, M. W. (2014). A New State-Level Panel of Annual Inequality Measures over the Period 1916 – 2005. *Journal of Business Strategies*, 31(1), 241-263.

Gao, P., Lee, C., & Murphy, D. (2017). Municipal Borrowing Costs and State Policies for Distressed Municipalities. Journal of Financial Economics, forthcoming.

Gao, P. and Qi, Y. (2015). Political uncertainty and public financing costs: Evidence from U.S. municipal bond markets. Unpublished working paper, University of Notre Dame and the City University of Hong Kong.

Harris, A. (2017). Anxiety Over the Debt Ceiling Is Showing Up in Treasury Bills. Bloomberg, July 21, 2017.

Harris, L. E., & Piwowar, M. S. (2006). Secondary trading costs in the municipal bond market. *The Journal of Finance,* 61(3), 1361-1397.

Hastie, K. L. (1972). Determinants of municipal bond yields. *Journal of Financial and Quantitative Analysis*, 7(03), 1729-1748.

Hull, J., Predescu, M. and White, A. (2004). The relationship between credit default swap spreads, bond yields, and credit rating announcements. *Journal of Banking & Finance*, 28(11), pp.2789-2811.

Jaggi, B., & Tang, L. (2017). Geographic location of the firm and credit rating accuracy. *Journal of Accounting, Auditing & Finance*, *32*(2), 155-181.

Kao, C., & Wu, C. (1994). A re-examination of the impact of credit ratings and economic factors

on state bond yields. Review of Quantitative Finance and Accounting, 4(1), 59-78.

Kedia, S., Rajgopal, S. (2011). Do the SEC's enforcement preferences affect corporate misconduct? Journal of Accounting & Economics, 51, 259-278.

Kessel, R. (1971). A study of the effects of competition in the tax-exempt bond market. Journal of Political Economy, 79(4), 706-738.

Kidwell, D. S., Sorensen, E. H., & Wachowicz, J. M. (1987). Estimating the signaling benefits of debt insurance: the case of municipal bonds. *Journal of Financial and Quantitative Analysis,* 22(03), 299-313.

Li, P., Tang, L. & Jaggi, B. (2017). Social Capital and Municipal Bonds. *Journal of Business Ethics, forthcoming.*

Layman, G. C., & Carsey, T. M. (2002). Party polarization and "conflict extension" in the American electorate. *American Journal of Political Science*, 786-802.

Levendusky, M. (2009). *The partisan sort: How liberals became Democrats and conservatives became Republicans*. Chicago and London: University of Chicago Press.

Lessig, L. (2011). *Republic, lost: how money corrupts congress--and a plan to stop it*. New York: Twelve/Hachette Book Group.

Longstaff, F. A. (2011). Municipal debt and marginal tax rates: Is there a tax premium in asset prices? *The Journal of Finance*, *66*(3), 721-751.

Malloy, C. J. (2005). The geography of equity analysis. *Journal of Finance*, 60, 719-755.

Marlowe, J. (2006). Volume, Liquidity, and Investor Risk Perceptions in the Secondary Market: Lessons from Katrina, Rita, and Wilma. Municipal Finance Journal, 27(2), 1-37.

Marlowe, J. (2011). Municipal credit default swaps: Implications for issuers. *Municipal Finance Journal,* 32(02), 1-28.

Marlowe, J. (2015). Municipal bond liquidity before and after the financial crisis. *Municipal Finance Journal, forthcoming*.

McCarty, N., Poole, K. T., & Rosenthal, H. (2006). Polarized America: The dance of ideology and unequal riches. Cambridge, MA: The MIT Press.

McCarty, N. (2007). The Policy Effects of Political Polarization. In The Transformation of American Politics: Activist Government and the Rise of Conservatism, edited by Paul Pierson and Theda Skocpol. Princeton University Press.

McCarty, N., Poole, K. T., & Rosenthal, H. (2009). Does gerrymandering cause polarization? *American Journal of Political Science*, *53*(3), 666-680.

Miller, M., (1977). Debt and taxes. *Journal of Finance*, 32, 261–275.

Moody's Investors Service. (2013) US States Rating Methodology.

Moody's Investors Service. (2017). Moody's Downgrades Illinois GOs to Baa3 from Baa2, Affecting $31.5B of GO and Related Debt; Outlook Negative.

Nanda, V., & Singh, R. (2004). Bond insurance: What is special about munis? *The Journal of*

*Finance,* 59(5), 2253-2280.

Nauss, R. M. (1986). True interest cost in municipal bond bidding: An integer programming approach. *Management science*, *32*(7), 870-877.

Novy-Marx, R., and Rauh, J. D. (2012). Fiscal imbalances and borrowing costs: evidence from state investment losses, American Economic Journal: Policy 4, 182-213.

Park, Y. J., Matkin, D. S., & Marlowe, J. (2017). Internal control deficiencies and municipal borrowing costs. *Public Budgeting & Finance*, *37*(1), 88-111.

Pew Research Center (2014). Political Polarization in the American Public.

Poterba, J. M., and Rueben, K. (1999). State fiscal institutions and the U.S. municipal bond market, Chapter in Fiscal Institutions and Fiscal Performance, University of Chicago Press.

Prior, M. (2007). *Post-broadcast democracy: How media choice increases inequality in political involvement and polarizes elections*. New York: Cambridge University Press.

Schultz, P. (2012). The market for new issues of municipal bonds: The roles of transparency and limited access to retail investors. *Journal of Financial Economics,* 106(3), 492-512.

Schwert, M. (2017). Municipal bond liquidity and default risk. *The Journal of Finance*, 72, 1683–1722.

Shor, B., & McCarty, N. (2011). The ideological mapping of American legislatures. *American Political Science Review*, *105*(3), 530-551.

Simonsen, W., & Robbins, M. D. (1996). Does it make any difference anymore? Competitive versus negotiated municipal bond issuance. *Public Administration Review*, 57-64.

Standard & Poor's. (2017). Illinois Various Debt Ratings Lowered One Notch On The State's Deteriorating Fiscal Condition; On CreditWatch Negative.

Tufte, E. R. (1973). The relationship between seats and votes in two-party systems. *American Political Science Review*, *67*(2), 540-554.

Theriault, S. M. (2008). *Party polarization in congress*. New York: Cambridge University Press.

Voorheis, J., McCarty, N., & Shor, B. (2017) Unequal Incomes, Ideology and Gridlock: How Rising Inequality Increases Political Polarization. Unpublished working paper, University of Oregon, Princeton University, and Georgetown University.

Wang, J., Wu, C., & Zhang, F. X. (2008). Liquidity, default, taxes, and yields on municipal bonds. *Journal of Banking & Finance*, *32*(6), 1133-1149.

Appendix A

Variable Description

| Variables Name | Description and Measurement |
|---|---|
| **Dependent Variables:** | |
| Bond Yield (primary market) | A bond's yield to maturity at the time of issuance. |
| Bond Yield (secondary market) | A bond's yields in the secondary market. Calculated using the volume-weighted trade price for each bond on each date and takes into account discounts or premiums. |
| **Main Independent Variable** | |
| Polarization | The construction of the variable follows Shor and McCarty (2011) to get maximum level of polarization between house and senate chambers at the state level. |
| **Bond-Level Control Variables:** | |
| Bank Qualified | An indicator variable that takes a value of one for bonds which banks can deduct the interest expense for the purchase or carry of these obligations and zero otherwise. |
| Bond Rating | A numerical categorization of the bond's credit rating assigned by the rating agencies. Appendix B shows the numerical classification. |
| Bond Size | Natural logarithm of an individual bond issue in a bond offering. |
| Callable | An indicator variable that takes a value of one for bonds where the issuer is permitted to redeem the bond between the transaction date and maturity date and zero otherwise. |
| Competitive Bid | An indicator variable that takes a value of one for bonds which the underwriter is engaged through a competitive offering and zero otherwise. |
| GO Bond | An indicator variable that takes a value of one for bonds that are general obligation bonds and zero otherwise. |
| Insurance | An indicator variable that takes a value of one for bonds with insurance and zero otherwise. |
| Maturity | The maturity of the bond, measured in years. |
| Puttable | An indicator variable that takes a value of one for bonds in which bondholders have the option to sell the security back to the issuer at a specified price and time. |
| Treasury Yield | Treasury yields are collected from the Center for Research in Security Prices (CRSP). They are the daily CRSP fixed-term indices for the periods 1, 2, 5, 7, 10, 20 and 30 years. We match each state bond with a Treasury bond by duration. We use linear interpolation of the yields of the two Treasury bonds that have the next lower and higher duration relative to the respective state bond. We delete observations with a duration of less than one year. For bonds with a duration of more than 30 years, we use the 30-year Treasury yield. |
| Volume-weighted Price | Volume-weighted trade price for each bond on each date when the bond is traded. The variable is restricted to the trades that are customer initiated buy orders. |
| **State-Level Control Variables:** | |
| Income | The income per capita in a state is first deflated by the Consumer Price Index. The natural logarithm is then applied to the variable. |
| Population | The natural logarithm of a state's population. |

Appendix B

Classification of Bond Ratings

| S&P Rating | Numerical Code |
|---|---|
| AAA | 1 |
| AA+ | 2 |
| AA | 3 |
| AA- | 4 |
| A+ | 5 |
| A | 6 |
| A- | 7 |
| BBB+ | 8 |
| BBB | 9 |
| BBB- | 10 |

This table lists the numerical codes associated with the ratings assigned by S&P.

Table 1

Polarization Measurement

| Year | Maximum Polarization | | |
|---|---|---|---|
| | Mean | Standard Deviation | Number of States |
| 1999 | 1.40 | 0.47 | 49 |
| 2000 | 1.41 | 0.47 | 50 |
| 2001 | 1.42 | 0.46 | 50 |
| 2002 | 1.43 | 0.46 | 50 |
| 2003 | 1.47 | 0.47 | 50 |
| 2004 | 1.48 | 0.46 | 50 |
| 2005 | 1.49 | 0.46 | 50 |
| 2006 | 1.49 | 0.46 | 50 |
| 2007 | 1.52 | 0.48 | 50 |
| 2008 | 1.52 | 0.48 | 50 |
| 2009 | 1.57 | 0.52 | 32 |
| 2010 | 1.55 | 0.49 | 38 |
| 2011 | 1.67 | 0.50 | 46 |
| 2012 | 1.68 | 0.49 | 48 |
| 2013 | 1.69 | 0.50 | 49 |
| 2014 | 1.69 | 0.51 | 48 |

Table 2

Summary Statistics

| Variable | Full Sample | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | Std. Dev. | Min | Max | 1st Quartile | 2nd Quartile | 3rd Quartile |
| Polarization | 45177 | 1.69 | 0.54 | 0.46 | 3.17 | 1.35 | 1.61 | 1.94 |
| Bond Yield | 45177 | 3.50 | 1.28 | 0.00 | 12.00 | 2.72 | 3.74 | 4.40 |
| Bond Size | 45177 | 15.21 | 1.70 | 8.52 | 22.76 | 14.12 | 15.47 | 16.45 |
| Maturity | 45177 | 10.34 | 6.21 | 0.52 | 41.75 | 5.30 | 9.54 | 14.54 |
| Rating | 45177 | 2.76 | 1.45 | 1.00 | 9.00 | 2.00 | 3.00 | 3.00 |
| Insurance | 45177 | 0.22 | 0.41 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| GO Bond | 45177 | 0.71 | 0.46 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 |
| Competitive Bid | 45177 | 0.41 | 0.49 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Callable | 45177 | 0.46 | 0.50 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| Puttable | 45177 | 0.00 | 0.02 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| Bank Qualified | 45177 | 0.01 | 0.09 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| Treasury Yield | 45177 | 3.61 | 1.51 | 0.10 | 6.64 | 2.48 | 3.98 | 4.74 |
| Population | 45177 | 15.70 | 1.02 | 13.14 | 17.46 | 15.07 | 15.65 | 16.35 |
| Income | 45177 | 9.81 | 0.15 | 9.42 | 10.26 | 9.72 | 9.81 | 9.90 |
| Tax Rate | 45177 | 5.66 | 3.34 | 0.00 | 14.10 | 3.60 | 6.13 | 7.83 |
| Adjusted Yield | 269241 | 3.93 | 1.12 | 0.54 | 9.69 | 3.22 | 4.03 | 4.70 |

This table reports descriptive statistics for key variables. See Appendix A for variable definitions.

Table 3

Correlation Matrix

| Variable | Bond Yields | Polarization | Bond size | Maturity | Rating | Insurance | GO Bond | Competitive Bid | Callable | Puttable | Bank Qualified | Treasury Yield | Population | Income | Tax Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bond Yields | 1 | | | | | | | | | | | | | | |
| Polarization | -0.021* | 1 | | | | | | | | | | | | | |
| Bond size | 0.012* | 0.162* | 1 | | | | | | | | | | | | |
| Maturity | 0.631* | 0.115* | 0.181* | 1 | | | | | | | | | | | |
| Rating | 0.149* | 0.345* | 0.103* | 0.115* | 1 | | | | | | | | | | |
| Insurance | 0.21* | -0.136* | -0.058* | 0.087* | 0.124* | 1 | | | | | | | | | |
| GO Bond | -0.036* | -0.047* | 0.118* | -0.007 | 0.072* | -0.206* | 1 | | | | | | | | |
| Competitive Bid | -0.167* | 0.009 | 0.081* | 0.017* | -0.125* | -0.095* | 0.144* | 1 | | | | | | | |
| Callable | 0.509* | 0.078* | 0.081* | 0.767* | 0.080* | 0.061* | 0.003 | 0.033* | 1 | | | | | | |
| Puttable | -0.005 | 0.014* | 0.038* | 0.040* | 0.011* | -0.013* | -0.026* | -0.015* | 0.003 | 1 | | | | | |
| Bank Qualified | -0.027* | -0.057* | -0.136* | -0.025* | 0.014* | 0.105* | 0.011* | 0.029* | 0.033* | 0.008 | 1 | | | | |
| Treasury Yield | 0.874* | -0.068* | -0.039* | 0.468* | 0.090* | 0.288* | -0.011* | -0.182* | 0.357* | 0.008 | -0.022* | 1 | | | |
| Population | 0.078* | 0.534* | 0.287* | 0.115* | 0.264* | -0.069* | -0.048* | 0.007 | 0.076* | 0.020* | 0.036* | 0.050* | 1 | | |
| Income | -0.098* | 0.127* | 0.299* | 0.033* | 0.130* | -0.022* | -0.01* | 0.08* | -0.001 | 0.003 | -0.008 | -0.124* | 0.176* | 1 | |
| Tax Rate | -0.029* | 0.256* | 0.038* | 0.020* | 0.325* | -0.142* | 0.028* | -0.098* | -0.001 | 0.006 | -0.057* | -0.035* | 0.036* | 0.003 | 1 |

Table 4

Impact of Polarization on Bond Yields

| | Predicted Sign | Coefficient | T Stat |
|---|---|---|---|
| **Polarization** | + | 0.273*** | 2.73 |
| Bond Size | - | -0.008 | -0.82 |
| Maturity | + | 0.052*** | 20.25 |
| Rating | + | 0.102*** | 3.8 |
| Insurance | - | -0.110*** | -3.82 |
| GO Bond | - | -0.119** | -2.25 |
| Competitive Bid | - | -0.063** | -2.51 |
| Callable | + | 0.136*** | 4.99 |
| Puttable | - | -1.159*** | -7.8 |
| Bank Qualified | - | -0.138* | -1.84 |
| Treasury Yield | + | 0.624*** | 41.81 |
| Population | - | -1.005** | -2.06 |
| Income | - | -0.674* | -1.87 |
| Tax Rate | +/- | 0.004 | 0.29 |
| Intercept | | 23.421 | 2.41 |
| Year, State Dummies | | Included | |
| N | | 45,177 | |
| R-squared | | 87.15% | |

This table shows the regression results for the impact of political polarization on bond yields. State and year fixed effects are included. The standard errors are clustered at the state level. See Appendix A for variable descriptions. ***,**,* denote statistical significance (two-sided) at the 1%, 5% and 10% levels, respectively.

Table 5

Impact of Polarization on Yield Spreads

| | Predicted Sign | Coefficient | T Stat |
|---|---|---|---|
| **Polarization** | + | 0.315*** | 2.75 |
| Bond Size | - | 0.002 | 0.17 |
| Maturity | + | 0.018*** | 7.92 |
| Rating | + | 0.081** | 2.2 |
| Insurance | - | -0.131*** | -3.9 |
| GO Bond | - | -0.118** | -2.05 |
| Competitive Bid | - | -0.075*** | -2.86 |
| Callable | + | 0.085** | 2.58 |
| Puttable | - | -1.054*** | -7.28 |
| Bank Qualified | - | -0.104 | -1.43 |
| Population | - | -1.13* | -1.98 |
| Income | - | -0.905** | -2.07 |
| Tax Rate | +/- | -0.002 | -0.13 |
| Intercept | | 27.403 | 2.29 |
| Year, State Dummies | | Included | |
| N | | 45,177 | |
| R-squared | | 51.32% | |

This table shows the regression results for the impact of political polarization on yield spreads. State and year fixed effects are included. The standard errors are clustered at the state level. See Appendix A for variable descriptions. ***,**,* denote statistical significance (two-sided) at the 1%, 5% and 10% levels, respectively.

Table 6

Interaction of Polarization and Bond Insurer Downgrades on Bond Yields in the Secondary Market

| Variable | Predicted Sign | Coefficient | T Stat |
|---|---|---|---|
| **Polarization*Post Period** | + | 0.133*** | 3.37 |
| **Polarization** | + | 0.902*** | 3.45 |
| Post Period | +/- | -4.285** | -2.19 |
| Bond Size | - | -0.043** | -2.46 |
| Maturity | + | 0.056*** | 21.11 |
| Rating | +/- | 0.019 | 1.56 |
| Insurance | - | -0.052* | -1.75 |
| GO Bond | - | 0.028 | 0.49 |
| Callable | + | 0.494*** | 15.58 |
| Puttable | - | 0.22 | 1.05 |
| Treasury Yield | + | 0.086*** | 4.04 |
| Population | - | 0.615 | 0.82 |
| Income | - | 0.357 | 1.09 |
| Tax Rate | +/- | 0.147** | 2.24 |
| Bond Size*Post Period | +/- | -0.028*** | -2.71 |
| Maturity*Post Period | +/- | 0.036*** | 9.03 |
| Rating* Post Period | +/- | 0.022 | 1.34 |
| Insurance*Post Period | +/- | 0.125** | 2.11 |
| GO Bond*Post Period | +/- | -0.172** | -2.58 |
| Callable*Post Period | +/- | 0.408*** | 8.56 |
| Puttable* Post Period | +/- | -0.396 | -1.15 |
| Treasury Yield*Post Period | +/- | -0.082* | -1.88 |
| Population*Post Period | +/- | 0.061*** | 2.74 |
| Income*Post Period | +/- | 0.304 | 1.5 |
| Tax Rate*Post Period | +/- | 0.007 | 0.9 |
| Intercept | | -11.918 | -1.09 |
| Year, State Dummies | | | |
| N | | 276,766 | |
| R-squared | | 65.88% | |

This table shows the comparable effect of political polarization on yields in the secondary market for municipal bonds before and after the insurer downgrades. The dependent variable is the adjusted yield of municipal bonds in the secondary market. The adjusted yields are calculated using the volume-weighted trade price for each bond on each date when it is traded. The adjusted yields take into account the discount and premium at which investor bought the bond. All independent variables are interacted with the dummy variable, Post Period. The adjusted yields are winsorized at 0.1%. All models include state and year fixed effects. The standard errors are clustered at the state level. See Appendix A for variable descriptions. N is the sample size of the regression. R-squared represents is a goodness of fit measure. ***,**,* represent significance beyond the 1st, 5th, and 10th percentile levels, respectively.

Table 7

Impact of Polarization on Bond Yields for Different Types of Bonds

| Variable | Predicted Sign | General Obligation Bonds | | Revenue Bonds | |
|---|---|---|---|---|---|
| | | Model 1 | | Model 2 | |
| | | Coefficient | T Stat | Coefficient | T Stat |
| **Polarization** | + | 0.397*** | 2.92 | 0.181 | 1.48 |
| Bond Size | - | -0.011 | -1.48 | 0.005 | 0.35 |
| Maturity | + | 0.053*** | 15.50 | 0.048*** | 12.37 |
| Rating | + | 0.122*** | 4.19 | -0.016 | -0.50 |
| Insurance | - | -0.123*** | -3.33 | -0.099** | -2.11 |
| Competitive Bid | - | -0.058 | -1.52 | -0.085** | -2.35 |
| Callable | + | 0.112*** | 3.12 | 0.196*** | 5.41 |
| Puttable | - | -1.125*** | -4.68 | -1.042*** | -7.86 |
| Bank Qualified | - | -0.106** | -2.57 | -0.123 | -0.45 |
| Treasury Yield | + | 0.63*** | 41.91 | 0.615*** | 23.21 |
| Population | - | -1.143* | -2.00 | -0.574 | -0.80 |
| Income | - | -0.890** | -2.04 | -0.864 | -1.26 |
| Tax Rate | +/- | 0.023* | 1.75 | -0.052* | -2.01 |
| Intercept | | 26.065 | 2.36 | 16.03 | 1.31 |
| Year, State Dummies | | Included | | Included | |
| N | | 31,914 | | 13,263 | |
| R-squared | | 88.33% | | 86.39% | |

This table shows the regression results for the impact of political polarization on bond yields for general obligation bonds and revenue bonds. Model 1 examines the impact of political polarization on bond yields for general obligation bonds. Model 2 examines the impact of political polarization on bond yields for revenue bonds. All models include state and year fixed effects. The standard errors are clustered at the state level. See Appendix A for variable descriptions. ***,**,* denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8

The Effect of Political Polarization with Additional Economic Controls

Panel A: Controls for State GDP

| | Predicted Sign | State GDP | | Percentage change in GDP | | GDP per capita | | Percentage change in GDP per capita | |
|---|---|---|---|---|---|---|---|---|---|
| | | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
| | | Coefficient | T Stat | Coefficient | T Stat | Coefficient | T Stat | Coefficient | T Stat |
| **Polarization** | + | **0.274**** | **2.64** | **0.277***** | **2.89** | **0.275**** | **2.61** | **0.277***** | **2.85** |
| State GDP Metric | - | 0.251 | 0.43 | -0.763 | -1.56 | 0.066 | 0.21 | -0.674 | -1.37 |
| Control Variables | | Included | | Included | | Included | | Included | |
| Year, State Dummies | | Included | | Included | | Included | | Included | |
| N | | 45,147 | | 45,147 | | 45,147 | | 45,147 | |
| R-squared | | 87.14% | | 87.15% | | 87.14% | | 87.15% | |

Panel B: Controls for State Income Inequality

| | Predicted Sign | Gini Index | | Theil Index | | Atkinson Index | |
|---|---|---|---|---|---|---|---|
| | | Model 1 | | Model 2 | | Model 3 | |
| | | Coefficient | T Stat | Coefficient | T Stat | Coefficient | T Stat |
| **Polarization** | + | **0.267***** | **2.83** | **0.280***** | **2.77** | **0.287***** | **2.81** |
| Income Inequality | +/- | 0.553 | 0.87 | 0.130 | 0.55 | 1.032 | 0.78 |
| Control Variables | | Included | | Included | | Included | |
| Year, State Dummies | | Included | | Included | | Included | |
| N | | 45,177 | | 45,177 | | 45,177 | |
| R-squared | | 87.15% | | 87.15% | | 87.15% | |

Panel C: Controls for Changes in State Income

| | Predicted Sign | Change in State Income Per Capita Model 1 Max Polarization | | Percentage Change in State Income Per Capita Model 2 Max Polarization | |
|---|---|---|---|---|---|
| | | Coefficient | T Stat | Coefficient | T Stat |
| **Polarization** | **+** | **0.272*** ** | **2.73** | **0.272*** ** | **2.81** |
| Change in State Income | - | 0.000 | 0.01 | -0.800 | -1.42 |
| Control Variables | | Included | | Included | |
| Year, State Dummies | | Included | | Included | |
| N | | 45,177 | | 45,177 | |
| R-squared | | 87.15% | | 87.16% | |

This table shows the effect of political polarization on the offering yields of municipal bonds with various economic controls. Panel A includes controls for four alternative measures of state economic conditions: state GDP, percentage change in state GDP, GDP per capita, and percentage change in GDP per capita. Panel B includes controls for the state income inequality. We measure income equality using three different measurements: Gini Index, Theil Index, Atkinson Index. These measures of income inequality are described in Frank (2014). Panel C includes controls for changes in state income per capita measured as either a dollar amount or percentage change. All models include control variables, state and year fixed effects. The standard errors are clustered at the state level. See Appendix A for variable descriptions. N is the sample size of the regression. R-squared represents is a goodness of fit measure. ***,**,* represent significance beyond the 1st, 5th, and 10th percentile levels, respectively.